# SUBOPTIMALITY OF SALES PROMOTIONS AND IMPROVEMENT THROUGH CHANNEL COORDINATION

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# Suboptimality of Sales Promotions and Improvement through Channel Coordination

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# Suboptimality of Sales Promotions and Improvement through Channel Coordination


## Abstract

This paper deals with sales promotions in the form of consumer price discounts in fast-moving consumer goods. First, we show analytically that suboptimality is to be expected with respect to the size of the consumer price discount. This is due to the separate decision making of the retailer and the manufacturer. We then compute the impact of this suboptimality for a database of eighty-six sale promotions, and we find that it is substantial. On average, the actual profitability of the sales promotions is only about one fourth of its potential profitability. The suboptimality problem can be solved through specific arrangements between retailer and manufacturer, which have the purpose of better channel coordination. One of these is a proportional discount sharing arrangement, in which each party contributes to the consumer price discount in proportion to its original margin (without sales promotion). Several other win-win arrangements are possible also.



## Keywords

Sales promotions

Channels of distribution

Consumer price discounts

Channel coordination

## 1 Introduction

Sales promotions are a frequently used instrument to stimulate the sales of products and brands. Current annual expenditures on sales promotions in the U.S.A. have recently been estimated at $ 112 billion, and comprise about 75% of total marketing communication expenditures[2]. In the Netherlands, total annual expenditures oo sales promotions are currently around 10 billion guilders ($4.5 billion)[3].

This study is about consumer price discounts, which is the dominant form of sales promotions. About half of all sales promotions in the Netherlands are price discounts[1]. For sales promotions in supermarkets, which is the subject of this study, the share of price discounts in sales promotions is even higher. A price discount is a decrease in the price that a consumer has to pay for a product, which lasts for a limited period of time. A typical discount offer in a supermarket lasts for one or two weeks. The usual effect of a price discount is an increase in sales of the product under discount. This sales increase can be small or large (Blattberg, Briesch and Fox 1995). Whatever its size, a sales increase does not automatically imply an increase in profit. And if a sales promotion does generate a profit, this may be a profit for the retailer, a profit for the manufacturer, or for both.

Over the last two decades, a substantial amount of academic work has been carried out on measuring the sales effects of price promotions. Especially since the advent of scanner data there has been an upsurge in this type of work (Wittink et.al. 1988; Blattberg and Neslin 1990; Blattberg, Briesch and Fox 1995; Van Heerde 1999; Van Heerde, Leeflang and Wittink 2001). This research is mainly devoted to the measurement of the effects of sales promotions in terms of *extra volumes* of the product sold because of the sales promotion. Much less empirical work has been done on the *profitability* of sales promotions. An exception is the recent paper by Srinivasan, Pauwels, Hanssens and Dekimpe (2001), which looks explicitly at revenue and profit impact of sales promotions. Profitability is also the aspect of sales promotions that we are interested in here. Whereas Srinivasan et.al. concentrate on measuring current

[2] Van Heerde (1999)
[3] Incentive Magazine

profitability (for both manufacturer and retailer) of actual sales promotions, we extend the analysis to the issue of how large the *suboptimality* is in current sales promotions and how the profitability can be increased by means of better *channel coordination* (Jeuland and Shugan 1983).

Often, doubts can be heard about the profitability of sales promotions, especially for the manufacturer, who allegedly would often be forced to participate through the power of the retailer (Achenbaum and Mitchel 1987; Farris and Ailawadi 1992; Ailawadi 2001; Nijs, Dekimpe, Steenkamp and Hanssens 2001). A sales promotion typically is the result of decisions of the manufacturer and the retailer. With suboptimality of a sales promotion we mean that the actual sales promotion does not exhaust the profit possibilities for the channel, or, put in a somewhat popular way, that the two parties together "leave money on the table". With respect to suboptimalities, we are especially interested in the mechanism that might underlie such suboptimalities, as well as the occurrence of suboptimality in practice. We also deal with the question of possible ways to overcome suboptimality, and how, through better channel coordination, to find win-win sales promotion arrangements for both parties.

In this paper we deal with price discounts in the context of *retailer promotions* (Blattberg and Neslin 1990). This means that a retailer temporarily reduces the price of a product to consumers. This can be done even in absence of a discount to the retailer from the manufacturer. However, in most cases both the retailer and the manufacturer pay a part of the consumer price discount. A sales promotion for a specific product, in a specific retail chain, during a specific period, including the agreement of how the costs of this promotion are carried by each of the two partners, is the result of a specific *arrangement* between manufacturer and retailer. Whether or not a price discount is profitable at the channel level depends on the extra sales (volume) it generates and the margin sacrificed on the regular sales, because of the price discount (see also Dekimpe and Hanssens 1999). If and how each of the two parties, the retailer and the

manufacturer respectively, profit from the sales promotion is dependent on how the burden of the consumer price discount is shared, i.e. how much each party contributes to the consumer price discount. [4]

## 2 Research Questions

The retailer and the manufacturer have their own profit functions. These two profit functions generally do not have their maximum at the same value of the consumer discount, nor will each maximum automatically coincide with the maximum of the profit for the channel. The price discount that the consumer is confronted with, is the sum of the price discount of the manufacturer and the price discount of the retailer. Most often, each party determines its contribution to the consumer price discount maximizing its own interest. Hence, sales promotions arrangements, will not automatically lead to "efficient sales promotions", i.e. sales promotions that maximize the profit for the channel. This suboptimality problem, its consequences, and the possibilities for solving it constitute the core of the present paper.

To understand the mechanism underlying possible suboptimalities, we will start by applying economic theory in order to deal with the following questions:

- What are the conditions for optimal (i.e. profit maximizing) price discounts, for the channel as a whole, and also for the retailer and the manufacturer separately?
- How serious is the danger of suboptimality if each party maximizes its own profit function? Is it possible to formulate conditions with respect to the sharing of the costs of the discount that steer both parties to the same, overall optimum?

[4] In addition to the costs of the discount itself (i.e. the price reduction for the consumer), a sales promotion involves planning and execution costs: organization costs, extra warehouse handling costs, costs of features (advertisements) in local newspapers, etc. (Verstappen, Van de Vorst and Wierenga 1998). While taking into account these costs, in this paper we concentrate on the two variables of the arrangement between manufacturer and retailer that are most important for the profitability of sales promotions: the size of the discount and the contribution to the discount by the retailer and the manufacturer.

In the empirical part we use data from actual sales promotions. In order to determine the profitability of actual sales promotions, as they have taken place in the market, not only information about the sales effects of the promotion is needed (additional volumes sold), but also information about its costs. And to determine the profitability of a sales promotion for the retailer and the manufacturer separately, we need information about production costs (cost price), the purchasing price of the retailer (regular and during the promotion), and the way planning and execution costs of sales are shared. For this research, we had access to a unique database containing the information, mentioned above, for eighty-six sales promotions in a food product category. These data were collected in the context of an ECR project. ECR stand for "Efficient Consumer Response" and is a movement in which trade partners work together in order to optimize the distribution channel

Our empirical questions are:

- How successful have retailers and manufacturers been, as measured from the profitability of the sales promotions in the database, and how large is the room to do better?
- To what extent are the interests of the retailer and the manufacturer in our database parallel or opposite and how does this affect the outcomes of sales promotions?

After both the theoretical and the empirical analysis, we will deal with the final question of this paper:

- Is it possible to improve channel coordination and to formulate arrangements between retailer and manufacturer, which are advantageous for both parties ("win-win arrangements") and how large would these improvements be, compared to the actual situation?

In order to address the first two issues, the paper continues with the (micro-economic) theory of optimal discounts. We will derive the conditions for the optimal discount, for the channel, the manufacturer and the retailer, respectively. Then we will look at the actual sales promotions in our database.

## 3 Economic Analysis of Sales Promotions

Research on channel relation often takes the perspective of one party, mostly the manufacturer. Marketing scholars have used the (Stackelberg) leader-follower model, with the manufacturer as the leader (McGuire and Staelin 1983; Coughlan 1985; Moorthy 1988). The issue is then how to maximize the results of the sales promotion for the manufacturer, taking into account information about the behavior of the retailer. In such a context, important questions are: which factors determine whether or not the retailer will agree or comply with a sales promotion initiated by the manufacturer (Murry and Heide 1998), or, what will be the pass-through rate of the price discount (Silva-Risso, Bucklin and Morrison 1999)?

Following Jeuland and Shugan (1983), we take a *symmetric* approach to the role of the two parties, retailers and manufacturers, that are involved in a sales promotion. In this approach it is assumed that manufacturers and retailers make optimal reactions to each other. Such manufacturer-retailer interaction has been called a vertical Nash equlibrium (Choi 1991). In a recent paper, based on an experimental study where the manufacturer sets the wholesale price and the retailer sets the retail margin, Messinger and Chen (2001) found that the symmetrical vertical Nash equilibrium describes their data better than the manufacturer Stackelberg leadership model.

In their by now "classic" article Jeuland and Shugan (1983) have dealt with the roots of the coordination problem in channels. They formulate this as follows: " Each channel member has its own decision variables. However, each channel member's decisions affect the other channel members' profits, and as a consequence, actions. A lack of coordination can lead to undesrable consequences." (p 239). We think that this mechanism also applies to decision making of manufacturers and retailers with respect to sales promotions. Our theoretical model is an extension of the Jeuland and Shugan approach to the case of sales promotions. We also make an empirical contribution by studying the suboptimality phenomenon in the context of actual sales promotions. Furthermore, we propose forms of arrangements between retailer and manufacturer that can help to prevent suboptimality and are beneficial for both parties.

A price discount has two effects on the profitability of a product: the profit is increased with the margin made on the extra volume generated by the discount (1), and the profit is decreased by the loss in margin on the baseline sales, i.e. the volume that would also have been sold under the (higher) non-discount price (2). As long as the discount does not erase the complete margin, effect (1) is positive (Dekimpe and Hanssens 1999). Assuming that this is the case, the sales promotion is profitable if effect (1) is larger than effect (2), i.e. if the additional profit on the extra sales outweighs the loss in profit on the baseline sales. If the difference between effect (1) and effect (2) is larger than the planning and execution costs of the sales promotion, a sales promotion is profitable.

In our analysis we assume that both parties, i.e. the manufacturer and the retailer, each pay a part of the costs of the consumer discount. The resulting discount at the channel level, the price discount of the consumer, is the sum of the discount given by the retailer and the discount given by the manufacturer. Sometimes the manufacturer offers a particular discount and "invites" the retailer to add his discount to this. In other cases the retailer takes the initiative and asks the manufacturer to do his part. However the actual arrangement comes about, in the end there is a consumer discount, and both parties, the manufacturer and the retailer contribute to this discount. It is clear that the allocation of the burden of the discount over retailer and distributor is an important determinant of the profit that each party derives from the sales promotion.

We define the following variables.

$p$ = regular consumer price
$q$ = volume of the product sold (in units)
$s$ = selling price of the manufacturer to the retailer (regular, i.e.in the absence of sales promotions)
$c$ = cost price of the product for the manufacturer
$d_r$ = price discount given by the retailer (in guilders)
$d_m$ = price discount given by the manufacturer (in guilders)
$d_c$ = total price discount for the consumer ($d_c = d_r + d_m$)
$p_d$ = consumer discount price ($p_d = p - d_c$)
rsd = retailer's share in the consumer discount (rsd=($d_r$/ $d_c$)

B = baseline sales, i.e. the sales volume of the product in the absence of the sales promotion
$F_r$ = fixed costs of the retailer
$F_m$ = fixed costs of the manufacturer
$FS_r$ = fixed costs of the sales promotion for the retailer (planning & execution costs)
$FS_m$ = fixed cost of the sales promotion for the manufacturer (pl. & exec. costs)
$\Pi_r$ = profit from the sales promotion for the retailer
$\Pi_m$ = profit from the sales promotion for the manufacturer
$\Pi_c$ = profit from the sales promotion for the channel ($\Pi_c = \Pi_r + \Pi_m$)

*Maximizing the channel profit*

From a channel point of view, the goal of a sales promotion should be to generate as much profit for the channel as possible. This goal is identical to the ECR norm of "maximizing total system efficiency", referred to earlier. This means that the price (after discount) should be the price that maximizes channel profit, given the cost price of the product. This is a standard micro-economic problem, which can be analytically solved when the function describing the relationship between the (discount) price and the volume sold is known. Here we assume that this function is linear, i.e. of the form:

$$q(p_d) = \alpha + \beta p_d \qquad (1),$$

with $\alpha$, $\beta$ parameters.

A linear demand function is in agreement with utility maximizing consumers with quadratic utility functions (Shubik and Levitan 1980), and has been applied succesfully in many marketing studies, e.g. Brodie and De Klyver (1984), Bolton (1989) and Sayman, Hoch and Raju (2001). In empirical work on price functions in the context of sales promotions sometimes deviations from linearity have been encountered, however, for exanple threshold effects, saturation effects and even non-monotonicity (Gupta and Cooper 1992; Kalyanam and Shively 1998; Van Heerde, Leeflang and Wittink 2001). On the other hand, it can be observed that in many cases a linear function is at least an acceptable approximation over a considerable interval of the prices, see for example Van Heerde, et. al. 2001). Our purpose here is not sophisticated estimation, but the derivation of conclusions about optimal sales promotions with a reasonable robustness.

In the situation of no discount $p_d = p$ ($d_c=0$). Hence the *baseline profit* (i.e. the profit without sales promotion) at the channel level can be written as:

$(\alpha +\beta p)(p-c)-F_m-F_r$ (2).

The channel profit with the *price discount* is:

$[\alpha + \beta(p-d_c)](p-c- d_c) -F_r-F_m-FS_r-FS_m$ (3).

The channel profit due to the sales promotion is obtained by subtracting expression (2) from expression (3). After rearranging terms, this results in:

$\Pi_c = -\beta d_c(p-c-d_c) - d_c(\alpha +\beta p) -FS_r-FS_m$ (4).

The interpretation of Equ (4) is straigthforward. The first term of the right-hand side is the margin made on the extra volume generated by the discount, whereas the second term is the loss in margin on the baseline sales ($B= \alpha +\beta p$).

To find the optimal discount at the channel level, $\delta\pi_c/\delta d_c$ should be set equal to zero. This results in:

$- \beta p + \beta c + 2\beta d_c -B=0$ (5),

or,

$\mathbf{d_c^*(chan) = (p-c)/2 + B/(2b)}$ (6),

where $d_c^*$(chan) is the optimal consumer discount from the perspective of the channel. Note that usually $\beta<0$, hence we have a maximum.

Equation (6) implies that the channel discount should be larger as the initial consumer price is higher and the (manufacturing) cost price is lower. Since usually: $\beta<0$, the optimal discount is smaller as the baseline sales are larger. This is clear, since on every unit of the baseline sales the loss in margin caused by the discount is felt.

Next, we derive the expressions for the optimal consumer discount for the retailer and the manufacturer, respectively.

*Maximizing the profit of the retailer*

The *baseline profit* (i.e. without sales promotion) of the retailer is:

$(\alpha + \beta p)(p-s)-F_r$ . (7).

The retailer's profit with the *price discount* is:

$(\alpha + \beta p-\beta d_m-\beta d_r)(p-s-d_r)-F_r-FS_r$. (8).

The retailer's profit due to the sales promotion, $\Pi_r$, is the difference between expression (8) and expression (7). After rearranging terms, we have:

$\Pi_r = -\beta(d_m+d_r)(p-s-d_r) - (\alpha + \beta p)d_r - FS_r$ (9).

Eqation (9) makes shows that the profit of the retailer due to the sales promotion is the extra margin on the additional sales, generated by the price discount (first term of the right hand side) minus the loss on the baseline sales and the fixed costs of the sales promotion (second and third term, respectively).

This formulation of the profit function makes clear that we do not take into account the effect of forward buying in our analyses. Forward buying means that a part of the goods for which the retailer receives a discount from the manufacturer are sold to the consumer at the regular price, which implies an additional profit for the retailer. Also we do not take into account cannibalization effects of sales promotions. Forward buying and cannibalization are important factors that also influence the profitability of sales promotions. However they are not the focus of the research here. The present study concentrates on the effect of the consumer price discount, and the way the retailer and the manufacturer contribute to the consumer price discount, on the profitability of sales promotions.

If the retailer would be able to set the consumer discount, which value would he choose in order to maximize $\Pi_r$? In Equ (9) we substitute ($d_m$+$d_r$) by $d_c$ and $d_r$ by rsd*$d_c$. So we have:

$\Pi_r = -\beta d_c(p-s- rsd*d_c) - (\alpha + \beta p)\ rsd*d_c - FS_r$ (10).

Equ (10) writes the profit of the retailer, due to the sales promotion, as a function of the consumer discount $d_c$ , and the share of the consumer discount that the retailer pays (rsd).

After rearranging term in Equ (10), and substituting ($\alpha + \beta p$) by B, we have:

$\Pi_r = -\beta(p-s)d_c - B*rsd*d_c + rsd*d_c**2$ (11).

Differentiating Equ (11) to $d_c$, setting the derivative equal to zero, and solving for $d_c$ gives:

**$d_c^*$(ret) =(p-s)/(2*rsd)+B/(2**b**)** (12),

where $d_c^*$(ret) is the optimal consumer discount from the perspective of the retailer.

The interpretation of Equ (12) is straightforward. According to the first term on the right hand side, the optimal discount for the retailer is larger as his regular margin (p-s)) is larger. This margin (minus the discount) is earned on each extra unit sold through the discount. Also, naturally, as the retailer pays a larger share of the discount (rsd), his optimal discount is smaller. Furthermore, as in the case of the optimal channel discount (Eq 6), the retailer would strive for a smaller discount, as the baseline sales B are larger.

*Maximizing the profit of the manufacturer*

The profit of the manufacturer, due to the sales promotion, can be writt (13).

Substituting ($d_m$+$d_r$) by $d_c$, $d_m$ by (1-rsd)$d_c$ , ($\alpha$+$\beta$p) by B, and rearranging terms, we obtain:

$\Pi_m = -\beta(s-c)d_c - (B*rsd-B)d_c + (\beta-\beta*rsd)d_c**2$ (14).

Setting the first derivative of $\Pi_m$ to $d_c$ equal to zero, and solving for $d_c$ , gives:

**$d_c^*$(man)= (s-c)/(2*(1-rsd)) +B/(2**b**)** (15),

where, $d_c^*$(man) is the optimal consumer discount from the perspective of the manufacturer. Equ (15) implies that, similar to the retailer, the optimal discount for the manufacturer is larger as his regular

margin, in this case (s-c), is larger. Also in agreement with the situation for the retailer, the optimal discount for the manufacturer is smaller as the baseline sales (B) are higher. However, in contrast to the retailer, the optimal discount for the manufacturer is *larger* if the retailer pays a larger share of the discount (rsd).

**Potential suboptimality**

Notwithstanding the similarity in strucure of the equations for the optimal consumer discount (equations 12 and 15), these equations also show that the chance of arriving at the same optimum discount is slim. Usually the regular margin, (p-s) for the retailer and (s-c) for the manufacturer, will bedifferent for the tow parties. moreover the share in the discount (rsd) has opposite effects for the retailer and the manufacturer. Therefore, there is no reason to expect that the retailer and the manufacturer would opt for the same consumer discount, nor that a discount they might agree on, would automatically coincide with the optimal consumer discount for the channel. It is therefore quite likely that a resulting consumer discount is "uboptimal", i.e. it does not realize the maximum possible profit for the channel.

Example

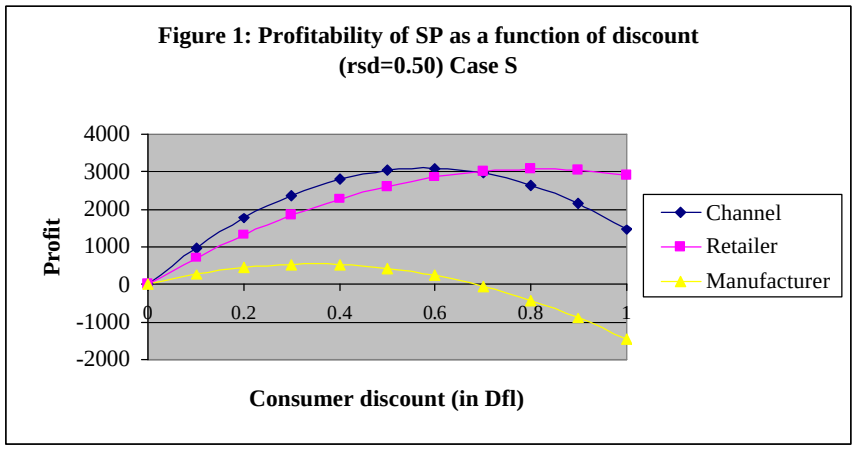
A numerical example can illustrate these phenomena. For this purpose, we use one of the sales promotion cases from our database. For this particular case the baseline sales were 989 (units), and a discount of Dfl 0.40 on the regular price of Dfl 2.19 resulted in a sales increase to 4676. The cost price is 0.92, and the regular selling price from the manufacturer to the retailer is 1.32. The retailer paid 50% of the discount. We will use this particular real-life illustration as a running example throughout the remainder of the text. We will refer to this sample case as Case S. Table 1 gives the basic data on Case S.

Table 1 Data on Case S

| | | | | | |
|---|---|---|---|---|---|
| p | = 2.19 | q(2.19) | = 989 | $d_r$ | = 0.20 |
| c | = 0.92 | q(1.79) | = 4676 | $d_m$ | = 0.20 |
| B | = 989 | s | = 1.32 | rsd | = 0.50 |

Substituting the two datapoints for price and sales into Equ (1) results in two equations from which the parameter $\alpha$ and $\beta$ can be computed. In this case $\alpha$ = 21175 and $\beta$ = -9218. Inserting these values in Equ (6) produces an optimal channel discount of 58 cent.

Apparently, in this case the actual discount of 40 cents has been too shallow. Considered from the perspective of the channel as a whole, a deeper discount would have generated a larger profit.




In Figure 1, for this particular case the profit from the sales promotion is given as a function of the consumer discount, for the channel, the retailer and the manufacturer, respectively.

Figure 1 shows that the profit functions for the channel, the retailer and the manufacturer, respectively, peak at different values of the consumer discount. The optimal consumer discount from the perspective of the retailer, as computed by Eq(12), is 82 cent, whereas from the manufacturer's point of view (using Eq15) the optimal discount is 35 cent. So in this case the retailer is would pay a larger discount, whereas

the manufacturer would like to temper it. The actual consumer discount of 40 cent is closer to the optimal value of the manufacturer, than the optimal value of the retailer. It is possible that this is due to a relatively strong negotiation position of the manufacturer in this particular case. However this may be, by applying the suboptimal consumer discount of 40 cent, the channel profit from the sales promotion (i.e. the profit of retailer and manufacturer together) is lower than if the channel-optimal consumer discount of 58 cent would have been chosen.

**Systematic suboptimality**

The last section has shown that there is no guarantee that the consumer discount, which results from the decisions of the manufacturer and the retailer, is the discount that maximizes the channel profit from the sales promotion. However, even if *individual* sales promotions might be off compared to the optimal channel discounts, it could still be that *on average* consumer discounts would not systematically be too low or too high. We will show that this is not the case, and that there is a built-in tendency of a systematic deviation from optimality.

*Interdepence of the channel members' decisions*

In the last section, we have approached the optimization problem of one particular party by determining the optimal value of the consumer discount for that party, given the *share of the discount* that he has to pay. Another way of looking at this problem is to ask what the optimal discount is for one party, given the *discount* paid by the other party. For example what is the optimal discount, $d_r$ , of the retailer, given that the discount given by the manufacturer is $d_m$? Equ (9) gives the retailer's profit, $\Pi_r$ , as function of $d_r$ and $d_m$. This equation shows that the profit of the retailer due to a sales promotion is larger as the manufacturer's discount, $d_m$ , is larger. Equ (13) shows that also the opposite is true: the manufacturer's profit is larger as the retailer gives a larger discount. The reason that one party profits from a larger discount by the other party, is that it reaps the benefits in the form of a margin on the additional sales generated by the lower price, caused by the price discount of the other party.

The partial derivative of Equ (9) with respect to $d_r$ is:

$$\delta\Pi_r/\delta d_r = -\beta(p-s-d_m-2d_r)-B \qquad (16).$$

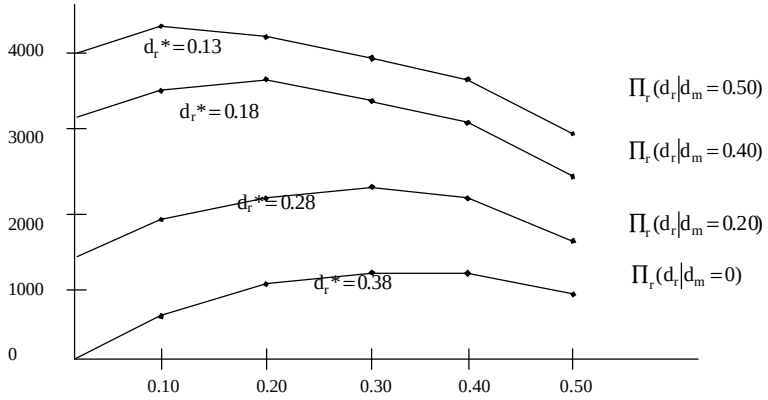
Setting this expression equal to zero and solving for $d_r$, leads to the optimal value of $d_r$, given a particular value of $d_m$:

$$d_r^*|d_m\,(ret) = B/(2\beta) + (p-s-d_m)/2 \qquad (17).$$

Equ (17) shows that the optimal value of the retailer's discount is dependent on the discount that is given by the manufacturer. The larger the discount of the manufacturer, the smaller the optimal discount of the retailer.

Figure 2, depicts, for Case S, the profitability of the sales promotion for the retailer as a function of the retailer's own discount. This profitability function is displayed for several values of the discount given by the manufacturer ($d_m$). Figure 2 shows that for a particular value of the retailer's discount, his profit is always larger as the manufacturer's discount is larger. Secondly, the optimal discount of the retailer decreases, as the manufacturer gives a larger discount. If the manufacturer would not give a discount at all, the retailer should give a discount of 38 cents. However, if the manufacturer would give a discount of 50 cents, the retailer should add a discount of his own of 13 cents only. So, the optimal value of the own discount is dependent on the discount given by the other party.

Figure 2: **Profitability of a sales promotion for the retailer as function of $d_r$, for different values of $d_m$ (Case S)**




We can derive a similar expression as Eq (17) for the optimal value of the discount of the manufacturer, $d_m$, given the discount by the retailer. Setting the partial derivative of Eq (13) with respect to $d_m$ equal to zero, and solving for $d_m$, leads to:

$$d_m^*|d_r\,(man) = B/(2\beta) + (s\text{-}c\text{-}\,d_r)/2 \qquad (18).$$

So, the manufacturer should set his discount at a lower value, as the retailer gives a higher discount. So if one party sets a larger discount, this not only has a direct positive effect on the profit of the other party, but also induces the other party to lower its discount.

We have seen earlier that the outcome of the decisions of the different parties together does not automatically result in a channel-optimal size of the discount, The question can be asked, if one party will tend to "restore" the optimal situation, if he explicitly uses knowledge of the discount of the other party in determining his own an optimal discount. The answer is only partially. This can be demonstrated once more with the example of Case S. In this case both the manufacturer and the retailer give a discount of 20 cent. So the consumer discount is 40 cent. We have seen earlier that for Case S the channel-optimal

consumer discount is 58 cent. If the retailer would use the information that the manufacturer has set his discount at 20 cent in determining his own optimal discount (Equ 17), he will set his own discount at 28. So, the consumer discount would then be 48 (20+28) cent, closer to the channel optimum of 58 cent, than the original consumer discount of 40 cent, but still a suboptimal situation. Also the opposite situation, if the manufacturer knows what the retailer's discount will be, and then maximizes his own profit (the popular Stackelberg leader-follower model), will generally not lead to the channel-optimal consumer discount.

*Myopic optimization*

The fundamental problem is that each party, by looking only at its own profit function, fails to take into account the effect of his decision on the profit of his channel partner. By doing so, the full channel effects are not taken into consideration, and therefore no overall, i.e. channel optimization, takes place. Jeuland and Shugan (1983) have identified this phenomenon as the main cause of a the lack of coordination in the channel. Gerstner and Hess (1995, p 44)) have called this cause the "double marginalization" problem: each party concentrates on its own marginal profit in setting its decision variables.

In the case of sales promotions this works as follows. Let's take the perspective of the retailer. The optimal price discount of the retailer, given the discount, $d_m$ of the manufacturer, is given by Equ (17). However, in choosing this discount, the retailer ignores that every increase in his discount, will generate more units through the channel, and in this way will increase the profit of the manufacturer. In other words, he is ignoring the gain from his action for the manufacturer. If the retailer would own the whole channel (i.e. also the manufacturer), he would also take the effect on the manufacturer's side into account. The effect of the retailer's discount on the manufacturer's profit is given by (Equ 13, with $\alpha+\beta p$ substituted by B):

$$\Pi_m = -\beta(d_m+d_r)(s-c-d_m)-Bd_m-FS_m \qquad (19).$$

The effect of *change* in the retailer's discount on the profit of the manufacturer is given by:

$\delta\Pi_m/\delta d_r = -\beta(s\text{-}c\text{-}d_m)$ (20).

So, if the retailer would set his discount $d_r$ in such a way that the channel profit is maximized, he would choose the value that makes the *sum* of the right-hand-sides of Equ(16) and Equ(20) equal to zero. Hence, the retailer's discount that maximize the profit of the channel, given the discount given by the manufacturer is:

$d_r^*|d_m\ (chan) = B/(2\beta) + (p\text{-}s\text{-}d_m)/2 + (s\text{-}c\text{-}d_m)/2$ (21).

A comparison of Equ (21) with Equ (17), reveals, that the difference between the value of the retailer's discount, that maximizes the (myopic) retail profit and the value that maximizes overall channel profit is: $(s\text{-}c\text{-}d_m)/2$.

So, as long as this expression is positive (which is the case if the margin of the manufacturer during the sales promotion is positive), the retailer's discount will be too small, considered from the overall channel perspective. In Case S, we have seen that for the current value of the manufacturer's discount (20 cent), the retailer will set his discount at 28 cent if he only maximizes his own profit, i.e. when using Equ 17. If he would set his discount at the value that maximizes the channel profit, using Equ 21, the optimal size of his discount is 38 cent. In this case total channel discount, $d_t$, would be 58 cent (20 +38) which is the optimal channel value, as we saw earlier. Here we have taken, the retailer's perspective, but the same analysis applies when taking the manufacturer's point of view. By setting his discount at the value that maximizes his own profit, this value will be too low, if considered from the point of view of the channel (as long as the margin for the other channel member is positive).

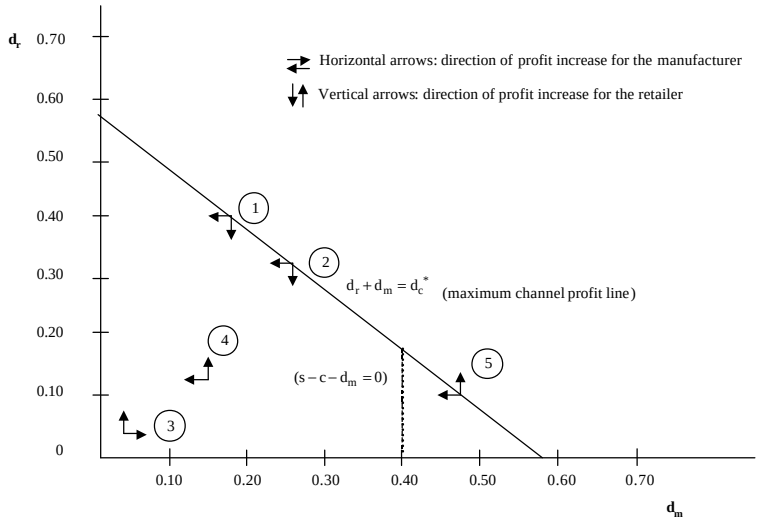
Jeuland and Shugan (1983) looked at the determination of price in the channel, and found that the lack of channel coordination leads to a *price that is too high* from the perspective of the channel. This result is mirrored by our finding for sales promotions, that when each party makes its own price discount decision,

the total *consumer discount will be too small* (i.e. the consumer price is too high). However, this is only the case if the margin for the other party, (s-c-$d_m$) in the analysis given above, is positive Therefore, we have extend this result, with the conclusion that a party can also be induced to press in the direction of a consumer discount that is *too high*, resulting in a consumer price that is to low. This is the case if the other's party margin is negative, as will be illustrated shortly.

*Directions of profit increase in the $d_r$ and $d_m$ plane*

Figure 3 is a diagram of $d_r$ and $d_m$ for Case S. At several points in this diagram arrows have been drawn.

Figure 3: **Diagram of $d_r$ and $d_m$ with profit directions for manufacturer and retailer (Case S)**




Invisible hand?

Horizontal arrows indicate the direction in which the profit of the manufacturer increases, vertical arrows indicate the direction in which the profit of the retailer increases. For example, point 1 is the point where $d_m$ =0.18 and $d_r$=0.40. The arrows at point 1 (pointing leftward and downward) indicate that both the manufacturer and the retailer would increase their profit by lowering their discount. Note that point 1 is on the line for which ($d_r$ + $d_m$ = $d_c^*$), i.e. for which the channel profit is maximum, i.e. "the maximum-channel-profit line" So, if parties are left to their own interests, they move away from the channel

optimum. The same is true for other points on the maximum-channel-profitability line, e.g. point 2. If there is an "invisible hand" here, this tends to lead parties away from, rather than towards, their common interest. Only if the actual discounts become very small, both parties have an incentive to increase their discount. This is the case, for example, for point 3, where both discount are as low as 5 cents.There are also locations in the diagram where one party has the incentive to increase its discount, and the other party to decrease it. This, for example is the case for point 4, where both the discount of the manufacturer and the discount of the retailer are 15 cents. At this point the retailer will increase his profit by making his discount larger, whereas for the manufacturer the opposite is true.

Discounts can also become too large

Interestingly, not at all locations of the maximum channel profit line have both parties an incentive to decrease their discount. Take for example point 5, where $d_m$= 50 cent and $d_r$ = 8 cent. Although here the manufacturer has an incentive to decrease his discount, whereas for the retailer a higher discount would be profitable. Apparently, here we have a situation where one party has the incentive to set the total consumer discount at a level that is *higher* than the channel optimum. The reason is that in this case $(s-c-d_m)<0$, i.e. the manufacturer has a negative margin. Now the retailer, by only taking into account his own profit ignores that every additional unit sold through the channel caused by his discount, will generate an additional *loss* (instead of a gain) at the side of the manufacturer. So, in general both parties are induced to make the channel discount too small, and only in the case that one party has a negative margin, the other party, by pursuing only its own interest, will be induced to a discount that is too large from a channel point of view.

At this point, we leave the theoretical domain to take a look at the actual sales promotion cases in the database. So far, our conclusions from the theoretical analysis can be summarized as follows:

- Generally, the optimal value of the consumer discount will be different for the channel, the retailer and the manufacturer. This makes it unlikely that the actual consumer discount will be equal to the channel-optimal discount.
- if each party takes into consideration the effect of its discount on its own profit only (myopic optimization), the result will be suboptimalization. Generally, this will lead to consumer price discounts that are not deep enough from a channel point-of-view.

## 4 Profitability of the Sales Promotions in the Database

We look at a large database of eighty-six sales promotions to examine how profitable these sales promotions have been, to see if the suboptimality of price discounts that we expect from the theoretical analysis does occur, and if so, to examine the size and direction of these suboptimalities.

*The data*

The data consist of eighty-six sales promotions in a food category that took place in a medium sized retailing chain (about one hundred shops) during the period of week 42 of 1996 to week 12 of 1997. All sales promotions are price discounts, and all sales promotions were supported by feature advertisements in door-to-door circulars distributed around the stores. Each sales promotion lasted one week. The eighty-six sales promotions are all the sales promotions that took place in the particular food product category, during the period under study in the specific retail chain. The data were collected in the context of an ECR project. The participants in this ECR project made all the relevant information available: regular consumer price, price discount given to the consumer, regular purchasing price for the retailer and purchasing price during discount (this makes it possible to compute rsd, the retailer's share in the discount). The information about the cost price of the manufacturer was incomplete. Based on the available data, we set the cost price of the manufacturer equal to 70% of the regular purchasing price of the retailer. (This was based on the detailed data that we did have for two cases. In companies exact cost prices are often not known either, and managers often work with similar assumptions.) The sales data are

scanner data collected by the retailer. These scanner data were also used to calculate baseline sales for each sales promotion, i.e. the predicted level of sales if no sales promotion would have taken place.

*Costs*

One purpose of the ECR project for which these data were collected, was to get a better insight in the *costs* of sales promotions. After a painstaking analysis of all the activities involved in the preparation and execution of sales promotions, both in the organization of the manufacturer and the organization of the retailer, using Activity-Based-Costing a cost figure was calculated for the "average" sales promotion with price discount, for the manufacturer as well as the retailer (Verstappen, Van de Vorst and Wierenga 1998). In the present study these average cost figures for the preparation and execution of sales promotions were subtracted from the extra profits generated by a sales promotion for the retailer and the manufacturer ($\Pi_r$, and $\Pi_m$ respectively.) Since these costs are "fixed" per sales promotion, they do not affect the impact on profit of different discount levels or different allocation schemes of the discount over retailer and manufacturer, which we will consider later. In the situation of these eighty-six sales promotions the costs of feature advertisements in local circulars were fully paid by the manufacturer. These were included in the fixed costs of a sales promotion for the manufacturer.

*Computation of profit*

In the computation of the profitability of sales promotions that we carry out in this paper, we consider the extra profit for the specific item due to the sales promotion, i.e. the increase in the difference between revenue and purchasing costs, diminished with the fixed costs per sales promotion. As mentioned earlier, in this study we do not take into account forward buying. The product category consists of food products with a short shelf life, so that forward buying is not an important phenomenon here anyway.

Table 1 provides descriptive statistics for the eighty-six sales promotions.

Table 1: Descriptive statistics for the sales promotion cases in the database

| | **MIN** | **MAX** | **MEAN** | **St dev** | **Coefficient of variation** |
|---|---|---|---|---|---|
| *Baseline Sales (B)*[1] | 109 | 34662 | 3923 | 7398 | 1.89 |
| *Discount ($d_c$)*[1] | 0.06 | 1.10 | 0.37 | 0.21 | 0.57 |
| *Regular consumer price (p)*[1] | 0.69 | 4.99 | 2.08 | 0.87 | 0.42 |
| *Retailer share in discount (rsd)* | 0.19 | 1.00 | 0.70 | 0.41 | 0.59 |

[1] In guilders

As Table 1 shows, there is a wide variation in baseline sales, the average baseline sales is 3923. The regular consumer price of the items ranges from 69 cents to Dfl 4.99. The average discount is 37 cent, which is 18% of the average regular consumer price of Dfl 2.08. The mean value of rsd implies that for the promotions in this database, the retailer has paid most of the discount (on average 70%). By not simply passing on the manufacturer's discount to the consumer, but making the discount bigger, the retailer "amplifies" the discount for the manufacturer. The mean "pass-through" (Bucklin 1987), which is computed as $d_c / d_m * 100\%$ , is 1/(1-0.70)* 100= 333. According to the vice-president sales of a major Dutch company in the fast-moving consumer goods sector[5], for a strong (A) brand, it is not uncommon for a a retailer to amplify the manufacturer's discount even with a factor as large as five, i.e. set $d_r = 5d_m$. Little primary information on actual trade promotions and retailer reactions in the U.S.A is available. In an early study, where they considered a broad range of product categories, Chevalier and Curhan found pass through rate ranging from 0 to 211%. In a more recent study Armstrong (1991) has reported pass-through rates for four product categories in FMCG which range from 143 to 285 %. So, the pass through rates in our study are comeparable, although on average a bit larger, than the ones found in these U.S. studies.

*Profitability of the sales promotions*

Table 2 gives information about the profitability of the sales promotions. It shows that about two third (67%) of all sales promotions has been profitable for the retailer, whereas about one third (37%) was profitable for the manufacturer. Only a very modest percentage: 18.6% percent (16 out of eighty six) of the sales promotions was profitable for *both* the retailer and the manufacturer. The relative low profitability for the manuafacturer might be interpreted as support for view of those, who think that with respect to sales promotions the manufacturer is in a somewhat weak position, against powerful retailers (see the discussion at beginning of this paper).

Table 2 Profitability of the sales promotions in the database for the retailer and the manufacturer (n=86)

| | *Profitable for Manufacturer (M+)* | *Not Profitable for Manufacturer (M-)* | **Total** |
|---|---|---|---|
| *Profitable for Retailer (R+)* | 16 | 43 | 59 (67%) |
| *Not Profitable for Retailer (R-)* | 16 | 11 | 27 (33%) |
| | 32 (37%) | 54 (63%) | 86 |

On average a sales promotion has produced a very small profit for the retailer (Dfl 158), whereas the average profit for the manufacturer was negative (- Dfl 23). These figures give a bleak verdict on the effectiveness of the sales promotions in our database. They also seem to confirm the often heard opinion that, as far as sales promotions in FMCG are concerned, retailers tend to be better off than manufacturers.

[5] private communication

There are very few results documented in the literature to compare these outcomes with. It is difficult to get figures about the actual profitability of sales promotions in practice.. However our figure of 18.6% is close to the figure of 16%, mentioned by Drèze and Bell (2001) which is based on information from the trade press. Srinivasan et. al. (2001) analyzed sales promotions in a Chicago supermarket chain, held over the period 1989-1997, for twenty-five product categories. Interestingly, they found that, on average, the manufacturer has benefitted more from the sales promotions (in terms of revenue increase) than the retailer. The fact that we find an opposite result, i.e. the retailer is better off than the manufacturer, might be explained by the fact that Srinivasan et.al. do not take into account the fixed costs of the sales promotions, for the retailer ($FS_r$)and the manufacturer ($FS_m$). As mentioned earlier, we used the actual figures of these costs to arrive at the results in Table 2. In our study, the bulk of the fixed costs sales promotions are the costs of feature advertisements in local circulars and these costs are fully paid by the manufacturer (Verstappen et.al. 1998).

Having observed the low profitability of the sales promotions in our databas, in the next section we will address the question to what extent these results are due to the suboptimality phenomena, discussed before.

*Extent of Suboptimality*

To examine the extent to which the potential channel profitability is actually realized by the channel partners, for each sales promotion the optimal channel discount was computed. This was done as follows. For each sales promotion, the baseline sales in the particular week was computed by taking the average weekly sales over a period of ten weeks, (five weeks before and five weeks after the focal week), leaving out the highest and the lowest value (to reduce the effect of possible outliers), weeks with promotions in the category and weeks with special days (e.g the Christmas period). The baseline sales is the sales realized at the regular price. Combining this with the information of the actual sales at the discount price, Equ(1) can be used, to compute for each sales promotion the deal response parameter $\beta$. Then, using Equ

(6), for each case the optimal channel discount was computed, and the channel profit generated with this optimal discount. The results are given in Table 3.

Table 3 Actual Channel Performance versus Optimal Channel Performance

| | **Actual** | **Optimal** |
|---|---|---|
| *DC (mean)* | 0.37 | 0.45 |
| *Channel profit* | 11554 | 44940 (+289%) |

Table 3 shows that there is a significant amount of suboptimality. By applying the optimal discounts instead of the actual ones, total channel profitability of the discounts can be increased with a factor of almost four.

From the theoretical analysis, we expect a negative bias in the discount, i.e. we expect that, overall, the discount will be too small. This is confirmed by the results. The average actual discount is 37 cent, whereas the average optimal discount is 45 cent. Probably, by looking at their own profitability of the sales promotion only, the channel partners tend to arrive at consumer price discounts that are not deep enough, as considered from the perspective of the channel. It is interesting to note that the correlation coefficient between actual and optimal consumer discount, computed over all eighty six sales promotions is as high as 0.71. This means that the channel partners have a reasonable sense of the desirable *direction* of the sales promotion. They know when a discount should be (relatively) large and when it should be small. This knowledge is probably based on their experience from earlier sales promotions. However, the channel partners systematically underestimate the desirable *size* of the discount.

*Opposite Interest of Manufacturer and Retailer*

We have shown that the channel parties currently do not tap the discount possibilities in an adequate way, and "leave money on the table". The question is how to arrive at a situation that is more attractive than the current one. It would help, of course, if the interests of both parties are parallel, but in the theoretical part of this paper, we saw that this is not necessarily the case. We examined this empirically for the cases in our database. First, we looked at regular sales occasions, i.e. without discounts. For this purpose, we computed for each of the eighty-six cases what the profit for the retailer and the manufacturer would have been without the sales promotions (using the baseline sales as the actual sales figure) and correlated these figures over the eighty-six sales promotion cases. Table 4 (upper part) gives the results. We did the same for *the profit changes due to the sales promotions*, of which the results are given in the lower part of Table 4.

Table 4 Retailer's and manufacturer's interests are parallel for regular sales, but opposite for sales promotions

| | |
|---|---|
| Regular sales: | |
| r (profit retailer, profit manufacturer) = (n=86) | 0.54 |
| Profit change due sales promotion for retailer and manufacturer, respectively: | |
| r ($\Pi_r$, $\Pi_m$) = (n=86) | - 0.55 |

From Table 4 it can be concluded that for regular sales there is a fair amount of parallel interest: if the profit for an item is higher for the retailer, on average, the profit is also higher for the manufacturer(r=0.54). However, for the profit changes due to the sales promotions (lower half of Table 4), the relationship is reversed. As a sales promotion is more profitable for the retailer it tends to be less profitable for the manufacturer, and vice versa (r=-0.55).

This conflict of interest makes it difficult to arrive at the optimal (channel) discount. For example, suppose that in each of the eighty-six cases we would move from the actual discount to the optimal (channel) discount (keeping the allocation of the discount over manufacturer and retailer (i.e. rsd) constant. Of course, this would result in higher profits for manufacturer and retailer together, but not in every case each of the two parties would be better off. This is directly clear from Table 5.

Table 5 Change in profitability due to optimal (channel) discount instead of actual discount (actual rsd)

| | M+[1)] | M- | |
|---|---|---|---|
| R+ | 11 | 45 | 56 |
| R- | 30 | 0 | 30 |
| | 41 | 45 | |

M+= profit increase for the manufacturer
R+=profit increase for the retailer, etc

Switching from the actual discount to the optimal (channel) discount results in a profit *increase* for the manufacturer in 41 cases and a profit *decrease* in 45 cases. So, in more than half of all cases the manufacturer is worse off. For the retailer the situation is somewhat better, but also here in 30 of the eighty-six cases (more than one third) the retailer is worse off, by moving to the optimal (channel) discount. Only in 11 cases (13% of all cases) *both* retailer and manufacturer would benefit from switching from the actual to the optimal discount. In these cases, it would be relatively easy to move both parties to the channel optimum. In all other cases, at least one party is likely to show resistance.

At this stage the conclusions from the empirical analysis of the cases in our database can be summarized as follows:

- The profitability of the sales promotions is modest at best. For the manufacturer only one third of the sales promotions is profitable, for the retailer two third is profitable, whereas less than twenty percent of all sales promotions is profitable for manufacturer *and* retailer.
- There is a significant amount of suboptimality in the current sales promotions. If in each case the channel-optimal consumer discount had applied instead of the actual consumer discount, total channel profits would have been about four times higher.
- As expected from the theory, there is an evident conflict of interest between the manufacturer and the retailer. As a sales promotion is more profitable for the manufacturer, it is less profitable for the retailer, and the other way around.
- Also in agreement with the theory, there is a systematic (downward) bias in the size of the consumer discount. On average, the discount has been too small, compared to the optimal channel discount.

So there is every reason to look for sales promotion arrangements that will remove these suboptimalities. This will be done in the next part of the paper.

**5 Proportional discount sharing arrangement**

Given that in the current situation the channel possibilities for discounts are not used to their full potential, we should look for ways to improve this situation. Can we devise "coordination mechanisms" (Jeuland and Shugan 1983, i.e. arrangements between retailers and manufacturers, that would systematically lead to more effective sales promotions for both parties? Such an arrangement should fulfill two conditions: it should (i) simultaneously make both the retailer and the manufacturer better off (i.e. make their interests parallel); and (ii) steer in the direction of the channel optimum.

We present what we call a "*proportional discount sharing arrangement*", which is an arrangement where the costs of the discount are allocated over retailer and manufacturer in proportion to their original margins. We will show that for a proportional discount sharing arrangement, the (profit) interests of retailer and manufacturer are parallel, in that they will aim for the same consumer discount, which is then also the discount that maximizes the channel profit. Therefore a proportional discount sharing arrangement provides an interesting option for solving the suboptimality problem of sales promotions through a win-win procedure.

Assume that the retailer's discount is set proportional to the manufacturer's discount, i.e.:

$d_r = td_m$ (22).

Now we can prove that the optimal discount of each party will coincide with each other and with the channel optimum, if:

$t=(p-s/s-c)$, (23),

or, put differently, if

$d_r /d_m = (p-s)/(s-c)$ (24),

i.e. the cost of the discount is allocated to the channel members in proportion to their margins before the sales promotion. We will call this a *proportional discount sharing arrangement.* The proof that such an arrangement leads both parties simultaneously to the channel optimum is given below.

From Equ (13) we have:

$\Pi_m= -\beta(d_m+d_r)(s-c-d_m)-Bd_m-FS_m$ (25).

Using Equ (22), and defining a new parameter $\tau$, according to:

$\tau =(1+t)$ (26),

we have:

$\Pi_m = -\beta\tau d_m (s-c- d_m) - Bd_m - FS_m$ (27).

Setting $\delta\Pi_m/\delta d_m = 0$ and solving for $d_m$ , gives:

$$d_m^* = B/(2\beta\tau) + (s-c)/2 \quad (28).$$

Using Equ (22) and Equ (26), we have:

$$d_r = (\tau - 1)\,[B/(2\beta\tau) + (s-c)/2] \quad (29).$$

Therefore:

$$(d_m^* + d_r) = B/(2) + \tau\,(s-c)/2 \quad (30).$$

Now if we set t= (p-s)/(s-c), which implies $\tau = (p-c)/(s-c)$,

$$(d_m^* + d_r) = B/(2\beta) + (p-c)/2 \quad (31).$$

Observe that the right hand side of Equ (31) is identical to the expression for the optimal consumer discount, as given by Equ (6). So, in a proportional discount sharing arrangement, the manufacturer will strive for a value of his discount which guarantees that the channel optimum is reached. In this case we have taken the perspective of the manufacturer, but starting with the retailer would have produced the symmetric result.

There is another way to show that a proportional discount sharing arrangement makes the interests of manufacturer and retailer parallel. Equ (12) is the expression for the optimal consumer discount from the perspective of the retailer, whereas Equ (15) gives the optimal consumer discount from the perspective of the manufacturer. This implies that:

$$d_c^*(\text{ret}) = d_c^*(\text{man}) \quad (32),$$

if

$$(p-s)/(2*rsd) = (s-c)/(2*(1-rsd)) \quad (34),$$

or if

$$rsd = (p-s)/(p-c) \quad (35).$$

The numerator of Equ (35) is equal to the retailer's margin before the discount. The denominator is the channel margin before the discount. Thus, Equ (35) says that the optimal value of consumer discount of

the retailer coincides with the optimal value of the consumer discount of the manufacturer in the case of a proportional discount sharing arrangement. We have just seen that this optimal value for retailer and manufacturer also coincides with optimal value for the channel.

So, we can now formulate the following theorem.

*Theorem of Proportional Discount Sharing (PDS):*

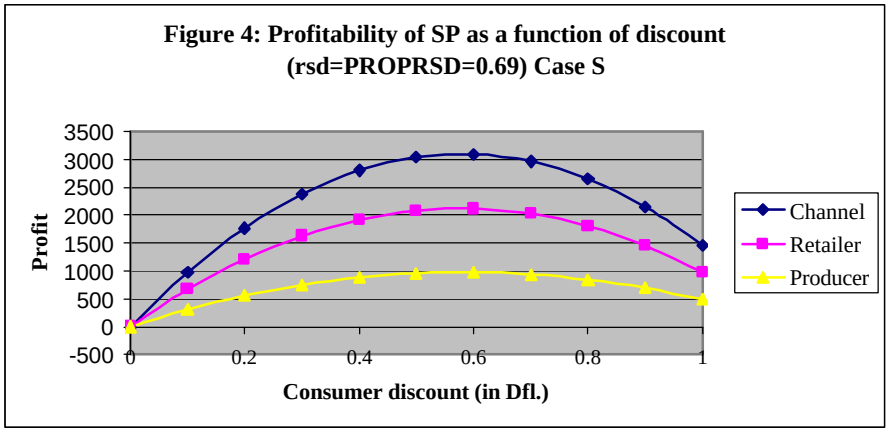
*For a linear price function, the optimal price discount for the retailer is equal to the optimal price discount for the manufacturer, if the costs of the discount are shared among retailer and manufacturer in the same proportion as the margin before the price discount. This price discount is equal to the optimal price discount for the channel*

Example

We can demonstrate the effect of rsd on the optimum for the retailer and the manufacturer for Case S. If the sharing of the costs of the discount occurs proportionally to the shares in the (original) margin, we have, according to Equ(35):

rsd =(2.19-1.32)/(2.19-0.92)=0.69.

We call this value PROPRSD. Figure 4 is a graph of the profit of the channel, the retailer and the manufacturer, as a function of the size of the discount.



In Figure 4, the profit curve of the retailer, the profit curve of the manufacturer and profit curve for the channel have a peak at a discount of 58 cent.

Comparison of Figure 4 with Figure 1 shows how the proportional discount sharing causes the three maximums to coincide. So, such an agreement is an effective way to make the interests of the retailer and the manufacturer parallel and, at the same time, get the most out of the channel.

For our dataset it can easily be illustrated how a PDS arrangement makes the interest of retailers and manufacturs parallel. For this purpose, we calculate what the correlation coefficient between the retailer's profit and the manufacturer's profit for the actual sales promotions in our case base would have been under PDS (assuming that the size of the consumer discount remains the same). This correlation coefficient is + 0.68, which compares very favorably to the actual value of -. 0.55, mentioned earlier. This demonstrates how effective the PDS arrangement is in making the interests of the retailer and the manufacturer parallel. Such an arrangement is easy to administer. Of the basic numbers that are needed for its execution, two items are known to both parties anyway: the regular consumer price (p) end the regular selling price of the manufacturer to the retailer (s). The third item needed, the cost price of the manufacturer (c), is a piece of information that should not be too difficult to share in a cooperative ECR-relationship. In principle, if a proportional discount arrangement is in force, it is not so important who of the two parties actually determines the size of the consumer discount. After all, it will automatically also serve the best interest of the other party. The best way would be to assign this task to the party who has the best knowledge of the consumer discount response curve.

## 6 Other Win-Win Arrangements

A proportional discount arrangement is an attractive method of cooperation for retailer and manufacturer who *jointly* want to realize the best possible sales promotion results from their market. However, sometimes it may not be in the best interest of one of the *individual* parties to enter into such an

agreement. This, for example, could be the case, if one party, by virtue of its market power, can enforce to pay a smaller share of the discount than the discount according to the proportional discount rule. For example, in Case S the retailer actually paid only 50% (20 cents) of the discount. According to the proportional discount rule, the retailer would have paid 69%.[6] In this situation the retailer might not have an incentive to switch to the proportional discount rule, even if this would lead to a channel-optimal discount. Suppose that for Case S the retailer is the stronger party and that he can in fact determine the consumer discount price. In this situation we can think of several options that the retailer has. The profit implications of some of these options, for himself and also for the manufacturer and the channel as a whole, are given in Table 7.

First, the retailer might use PDS and then maximize his profit (option 1) As Table 7 shows, this will increase the channel profit and the manufacturer's profit a great deal (compared to the actual sales promotion), but will actually *decrease* the retailer's profit (from 2272 to 2244). Paying only 50% of the discount cost in the actual situation was a better deal for the retailer. Therefore, switching to PDS might be considered by the retailer as a too altruistic move in this situation.

Table 7 Different options for the retailer of Case S to set the consumer discount and the effects on the profit derived from the sales promotion for the retailer, the manufacturer and the channel

| Option | | **1** | **2** | **3** | **4** |
|---|---|---|---|---|---|
| | **actual** | **max $P_r$ PDS** | **max $P_r$ $d_m$=0.20** | **max $P_c$ benef 50/50** | **max $P_c$ benef 100/0** |
| Level | | | | | |
| $\Pi_r$ (retailer) | 2272 | 2244 | 2334 | 2425 | 2576 |
| $\Pi_m$ (manuf) | 540 | 871 | 687 | 692 | 540 |
| $\Pi_c$ (chan) | 2812 | 3116 | 3021 | 3116 | 3116 |

However, this does not mean that it is best for the retailer to stick with the actual situation. When leaving the manufacturer's discount at 20 cent and then maximizing his own profit (applying Equ 17), the retailer

[6] [(2.19-1.32)/1.27 * 100].

can improve his profit from 2272 to 2334 (option 2). The other party, the manufacturer, would also profit this move (from 540 to 687). So, option (2) clearly dominates the actual situation; still from a channel point of view, this situation is suboptimal (3021 < 3116).

As we saw earlier, when one party, in this case the retailer, would maximize his own profit, he has the tendency to make the discount too low. An "enlightened retailer" recognizing this, would set the consumer discount at the channel optimum. But if he would simply set his discount at the difference of the channel-optimal consumer discount and the manufacturer's discount, the manufacturer would reap most of the benefits and the retailer would be worse off than in option 2. Therefore, an agreement has to be made about the distribution of the benefits from the additional profit at the channel level. A retailer with a very cooperative attitude might decide that both parties share equally in the additional profit. This is option 3 of Table 7. This option clearly dominates option 2, since its has better outcomes for both parties. However, a more selfish retailer might determine to keep 100% of the extra channel profit to himself (option 4). This would further increase the profit of the retailer, but *not at the cost of the manufacturer*. All these arrangements dominate the actual situation.

The bottomline is that, by applying a different discount arrangement from the actual one, there are several arrangements possible that either increase the profit of both parties (win-win agreements), or increase the profit of one party, without harming the other. The options 2,3 and 4 of Table 7 are examples of such win-win strategies which remove, partially or completely, the suboptimality with respect to sales promotions.

In order to realize these benefits, the most important point is that retailer and manufacturer recognize this potential, and overcome their shortsightedness. They should operate in two steps:

1. Determine the optimal consumer discount for the channel
2. Make an agreement about the allocation of costs and benefits from the sales promotion, which operates *after* step 1.

It is essential that step 2 is separated from step 1. The mechanisms for sharing costs and/or benefits that are currently in use do not make this separation and, as we have seen, lead the channel partners to suboptimal decisions. If each party follows its own (myopic) interest, suboptimality is inevitable. However, reaching the channel optimum has to be made attractive for both parties. This should be done by means of an agreement that regulates how costs and benefits will be allocated. The most efficient way is to do this through the height of the selling price from the manufacturer to the retailer during the sales promotion. When setting this selling price in agreement with a proportional discount arrangement, we combine the advantages of a procedure that is administratively efficient and induces both parties to strive for the channel optimum. In other cases (e.g. the other win-win arrangements just discussed) separate money transfers between parties may be necessary. When so-called "scan-back" arrangement are in force (Drèze and Bell 2001), i.e. where manufacturer and retailer settle the results of a sales promotion on the basis of actual sales figures from scanner data, care has to be taken that conditions of such a scan-back arrangement do not distract parties from striving for the channel optimum.

## 7 Conclusions, Implications, and Further Research

The subject of this paper is price discount sales promotions in FMCG. First, we have shown that from the point of view of (economic) theory, it is not to be expected that manufacturers and retailers strive for the same size of the consumer discount, nor that either one of these parties would strive for the channel-optimal consumer discount. In general, opposite interests between manufacturers and retailers exist, which makes it very unlikely that the result of their (independent) decisions will lead to the price discount that maximizes the channel profit from a sales promotion. So, there is a high likelihood that the two parties leave money on the table. Another important result from the theoretical analysis is that, if each party maximizes its own profit without looking at the interest of the channel, there is a systematic bias in the size of the consumer discount, usually resulting in a consumer price discount that is too low.

In our empirical analysis over more than eighty real life promotions, we found that these sales promotions as currently implemented, have a modest profitability, and that the channel profit on all sales promotions together could have been almost four times higher. So the expectation from the theoretical analysis of suboptimality is confirmed. This is also true for the expectation of opposite interests of the manufacturer and the retailer, which is clearly manifest in the data. Finally, as theoretically expected, in the actual sale promotions there is a negative bias in the size of the consumer discount, i.e. the discount are, on average, not deep enough.

Subsequently, we looked for arrangements between manufacturers and retailers that can remove suboptimality and lead to sales promotion arrangements that are more profitable for both parties ("win-win arrangements") than the current sales promotions. We found that a *proportional discount sharing arrangement*, i.e. an arrangement where the cost of the discount are shared by manufacturer and retailer in proportion to their original margin, automatically steers the interests of the manufacturer and the retailer in the same direction as far as the size of the consumer discount is concerned. This jointly optimal consumer discount is also the channel-optimal discount. Therefore, the PDS arrangement, is an interesting way of preventing suboptimality. We have also shown that various win-win arrangements are possible that constitute significant improvements compared to the actual outcomes for both parties.

From an academic point of view these results are important since they add to our insight of the mechanisms that determine the size of consumer price discounts, and their profit implications for both retailer and manufacturer. The results are also relevant for practice. It is important that retailers and manufacturers are aware of the mechanisms observed in this paper. If through independent partial optimization by both parties, the resulting discount is not optimal at the channel level, both parties together stand to loose. Especially within the framework of a long-term relationship between retailer and manufacturer, it should be possible to find more satisfactory arrangements. An attractive possibility is to use the proportional discount sharing arrangement. Such an arrangement can be implemented and

managed very easily. Especially if parties have to decide on many sales promotions, possibly in different product categories, over an extended period of time, this may be a very practical way of operating. However, even if parties would not be willing to engage in such an arrangement, as we have shown, there are win-win arrangements possible that clearly dominate the current way of "each party for itself". Making this type of arrangement is in the spirit of the ECR movement of better results through cooperation in the channel, and also in agreement with the ideas about working partnerships between distributors and manufacturers (Anderson and Narus 1990).

*Limitations and further research*

The theoretical results of this paper were derived using a linear discount-price demand function. Although this may be a reasonable approximation in many situations (an indication for this is the confirmation of the theoretical expectations in our database), it is worthwhile to explore the implications of non-linear demand curves. Whatever the specific form of the discount-price demand curve, the phenomenon that the action of one party (applying a specific price discount and in this way creating additional consumer sales) affects the revenue of the other party, remains the same. This is the very root of the suboptimality problem, caused by the myopic behavior of the parties. Moreover, both parties are affected in the same way by the shape of the discount-price demand curve, since for both parties the extra sales from a price discount is determined by the (local) derivative of this curve. Therefore, in the case of non-linear demand curves, the situation is not different in principle. But the actual magnitude of the consequences of suboptimality for each party (and also the gains and losses they will derive from particular sales promotion arrangements) will depend on the precise form of the discount-price response function. If retailers and manufacturers want to arrive at the best discount policy in a given situation (possibly using the multi-party decision support tools, to be referred to shortly), they should apply the best knowledge about the demand response function that is available for that situation. The recent advances with respect to estimation techniques ( Van Heerde et.al. 2001) are very important here. The decision support tools should be able to accommodate all kinds of discount-price demand curves (parametric as well as non-

parametric). An interesting extension of the present work would be to compute the precise effects of different specific demand curves on the magnitude of the suboptimality and the gains and losses from particular sales promotion arrangements.

In this paper we have abstracted from phenomena such as forward buying and cannibalization. Through forward buying, a retailer can realize an additional profit, because he sells a part of the goods that he has purchased at a discount price from the manufacturer, at the regular price to the consumer. In an overall consideration of a particular sales promotion arrangement, the retailer should weigh the additional profits from forward buying. Another issue is cannibalization. The additional sales (and profit) from the product under discount may replace the sales of other products, on which the supplier would have earned a profit too. This phenomenon is particularly important for the retailer, who typically offers many different products in the same category. The effects of forward buying and cannibalization should be superimposed on the effects of consumer price discounts as analyzed in this paper. It would be interesting, as a follow-up study, to examine how different schemes of forward buying and cannibalization affect the magnitude of suboptimality and the outcomes of specific sales promotion arrangements. Preferably, this should be done both analytically and empirically, as we did in the present paper. Of course, if the relevant information is available, these effects should also be incorporated in the decision support tools that retailers and manufacturers use to determine their price discounts.

As we have seen, to arrive at more profitable sales promotions, it is necessary that retailers and manufacturers enter into agreements about how to partition the burdens and benefits of sales promotions. The approach in the present paper is purely economical. However, in agreements about sales promotions also more behavioral variables such as trust and commitment between channel partners play a role (Geyskens, Steenkamp and Kumar 1998). Therefore, the present research should be extended by taking these variables into account, and see to what extent relationship quality variables (also including variables such as cooperation and conflict) have an effect on the actual conditions agreed upon in sales promotion

arrangements. For sure, also the relative power of each party (Kadiyali, Chintagunta and Vilcassim 2000) is an important explanatory variable here. Therefore, an interesting research avenue is to study how sales promotion arrangements between manufacturers and retailers actually come about, and the role of the relationship quality variables, just mentioned, in this process. Interesting questions are: what are the conditions agreed upon in these arrangements (e.g. in terms of price cuts, duration, agreements about features costs, range of products covered, etc), what are their antecedents (i.e. under what conditions do we see which type of arrangement) and what are their consequences in terms (profitability, relative gains of each party)? This will produce insight, which is important for realizing the type of win-win arrangements as discussed in this paper. We have found that (myopic) economic stimuli have the effect of moving parties away from the (channel) optimum. Some form of agreement or cooperation is needed to overcome this, and the potential for such agreements depends heavily on the psychological climate (trust, commitment, etc) between parties.

Finally, it seems important to provide retailers and manufacturers with tools for supporting their decisions with respect to price discounts. Parties should have access to models for computing the effects of alternative price discounts. They should also be able to compute the effects of different profit and cost sharing arrangements, for both the retailer and the manufacturer. The results of such simulations might help the retailer and the manufacturer to decide (if possible, jointly) on a consumer price discount arrangement in a particular situation. This would entail an extension of sales promotion support tools for one party, such as the manufacturers' sales promotion calendar tool of Silva-Risso et.al. (1999), to multi-party tools. The availability of a decision support system to help retailers and manufacturers to (jointly) determine the optimal consumer price discount would fill an obvious need.

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